UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND ANALYSIS OF AN INSTRUMENT TO TEST READING INTERPRETING DRAWING SKILLs

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Type your Department's name here) (Hons.)

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **: DESIGN AND ANALYSIS OF AN INSTRUMENT TO TEST READING INTERPRETING DRAWING SKILLS.**

SESI PENGAJIAN: **2013/14 Semester 2**

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This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

DECLARATION

I hereby, declared this report entitled “Design And Analysis Of An Instrument To Test Reading Interpreting Drawing Skills” is the results of my own research except as cited in references.

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ABSTRACT

This study aimed to investigate the seta measuring reading skills of young engineers in translating engineering drawing. To be effective, engineering drawings necessary to convey information accurately and it ensures that producers are able to interpret information presented in a clear and correct. Therefore, manufacturers require efficient engineering staff when producing and interpreting engineering drawings. In addition, manufacturers require competent engineering staff when producing and interpreting engineering drawings. This research study and investigate the efficiency and technical skills of young engineers from the perspective of the manufacturing industry. In particular, this study attempted to test using young engineers to learn their skills in translating and read engineering drawings. The questions contained in the test were related to engineering drawings which is a subjective and requires young engineers to think and imagine trying to answer the test. Study design using quantitative and qualitative research methods to answer a few questions submitted. The sample consisted of 44 students from the Faculty of Engineering Manufacture 4BMFR at the Universiti Teknikal Malaysia Melaka. The data were analyzed using SPSS, while qualitative data were analyzed according to the themes that have been identified. Study data is described in terms of percentages, descriptions and transcripts. The results of students writing reviews of high-skilled and low visualization was analyzed and found most of the questions asked are directly and indirectly. In conclusion, three objectives were achieved and some suggestions are proposed for future work.

ABSTRAK

Kajian ini bertujuan untuk mengkaji seta mengukur kemahiran jurutera muda dalam membaca dan menterjemah lukisan kejuruteraan. Untuk lebih berkesan, lukisan kejuruteraan diperlukan untuk menyampaikan maklumat dengan tepat dan ia memastikan bahawa pengeluar boleh mentafsir maklumat yang dibentangkan dengan jelas dan betul. Oleh itu, pengeluar memerlukan kakitangan kejuruteraan yang cekap apabila menghasilkan dan mentafsir lukisan kejuruteraan. Selain itu, pengeluar memerlukan kakitangan kejuruteraan yang cekap apabila menghasilkan dan mentafsir lukisan kejuruteraan. kajian ini mengkaji dan menyelidik kecekapan serta kemahiran teknikal jurutera muda dari segi perspektif industri pembuatan. Secara khususnya, kajian ini cuba menggunakan kaedah ujian terhadap jurutera muda untuk mengetahui kemahiran mereka didalam menterjemah dan membaca lukisan kejuruteraan. Soalan-soalan yang terdapat didalam ujian tersebut adalah berkaitan dengan lukisan kejuruteraan dimana ia berbentuk subjektif dan memerlukan jurutera muda perlu berfikir dan cuba berimaginasi untuk menjawab ujian tersebut. Reka bentuk kajian ini menggunakan kaedah penyelidikan kuantitatif dan kualitatif untuk menjawab beberapa persoalan kajian yang dikemukakan. Sampel kajian terdiri daripada 44 orang pelajar 4BMFR dari Fakulti Kejuruteraan Pembuatan di Universiti Teknikal Melaka Malaysia. Data-data dianalisis menggunakan SPSS, mana kala data kualitatif dianalisis mengikut tema-tema yang telah dikenal pasti. Data-data kajian digambarkan dalam bentuk peratusan, deskripsi dan transkrip. Hasil ulasan bertulis pelajar-pelajar berkemahiran visualisasi tinggi dan rendah telah dianalisa dan mendapati kebanyakkan soalan yang ditanyakan adalah secara langsung dan tidak langsung. Kesimpulannya, tiga objektif berjaya dicapai dan beberapa cadangan telah dicadangkan untuk kerja-kerja masa hadapan.

DEDICATION

Especially to my beloved parents and my whole family thank you very much to give me fully support, and also for my respective Lecture and my Superior, thank you so much for teaching and guided me. Last for my friends, I appreciate for your support. And all people participate also thank you very much.

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"In the name of Allah, Most Gracious, Most Merciful"

Alhamdulillah, praise to Allah S.W.T. for giving me the chance to complete my Final Year Project from the very beginning until the very end. It was a winding road in completing this project, but due to the help gained by God and people close to me, this burden is lightened. First of all, a million thanks are dedicated to my supervisor, En. Zulkeflee Bin Abdullah for his guidance, concerns and patience. Through the completion of this project, he has been my major supporter and reference. Although him is occupied with his work, he is willing to spend his valuable time to explain and answer all my doubts, question and inquiries about the project topic had given to me. I also would like to thanks to FKP lecturers for giving me advice and any idea about my topic. They are willing to help me answer most of my question without any hesitation. Their moral support and continuous guidance enabled me to complete my work successfully. Last but not least, I would like to express my grateful thanks to all my family members and my friends. Thanks for their support, encouragement and helping hands. Without their cares, I will not able to accomplish my project successfully.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

CAE	-	Computer Aided Engineering
RIED	-	Reading and Interpreting Engineering Drawings
DP	-	Depth
DIA	-	Diameter
CAD	-	Computer Aided Design
MCT	-	Mental Cutting Test
SCANS	-	Secretary's Commission on Achieving Necessary Skills
CAM	-	Computer-Aided Manufacturing
2D	-	Two Dimensional
3D	-	Three Dimensional
CES	-	Computer Education Software
CATIA	-	Dassault Systems Pioneer Brand
GDT	-	Geometric Dimensioning and Tolerancing
CM	-	Configuration Manager
EO	-	Engineering Order
ANSI	-	The American National Standards Institute Publication
BS	-	Brainstorming
>	-	More than
<	-	Less than
(+)	-	Better Than
(-)	-	Datum Concept
SPSS	-	Statistical Package for the Social Sciences
UNSW	-	University of New South Wales
BMFR	-	Bachelor in Manufacturing Design
Dif I	-	Difficulty Index
DI	-	Discrimination Index
+ve	-	Positive
-ve	-	Negative

CHAPTER 1
INTRODUCTION

This report presents a process to create a test that asses engineering students on reading and interpreting engineering drawings (RIED). Chapter 2 will describes in detail about the test of RIED skills. Chapter 3 describes both of these subjected and the data how the test works or useful for an engineer who can read also interpret the drawings. Chapter 4 in this report describes in detail and discuss about analysis the data related to the test which had done.

1.1 Project Background

Drawing skills are needed for fresh graduate engineers because at this time the skill is very important to find and get the job in engineering industries. An engineering drawing, a type of technical drawing, is used to fully and clearly define requirements for engineering items.

More than just the drawing of pictures, it is also a language a graphical language that communicates ideas and information from one mind to another. Most especially, it communicates all needed information from the engineer who designed a part of the workers who will make it.

1.2 Problem Statement

Mostly, many fresh graduate engineers cannot read and interpret the engineering drawing because lack of understanding of a concept drawing and they are not exposed to how to understand and interpret the drawing. However, there are many issues that can be raised in this problem where novice engineers cannot solve.

In manufacturing design it is to try and do the check drawing ability for contemporary graduate engineer desires need that queries the shortage of knowing what they face in interpret the drawing. The test must be validated and will be checked by the professional engineers or the person who knows more about an engineering drawing. Therefore, it will take time to form or make the question for test the novice engineers. In contrast this test will study on how to improve the manufacturing design in order to make the novice engineers can be expert in reading and interpret the drawing and increase their drawing skills to be better and perfect.

1.3 Objective

The objectives of this project are;

a. To find the suitable method for analyse skills of novice engineers in translating and reading engineering drawings.
b. To get validation for the test drawing skills.
c. To measure the undergraduate engineer skills in reading and interpreting engineering drawing.

1.4 Scope of Project

This project focused on how to get the validation and certificate about the test for state it's useful for the fresh graduate engineers before get their jobs. This test will analysis and propose how the undergraduate can know something about engineering drawing and enhance their drawing skills. Furthermore, the project intends to produce a test which can help the novice engineers. The scope of the project was finally to get validation and implement the test to all engineers.

1.5 Importance of Study

This project is mainly to study the performance of novice engineers' in reading and interpreting the engineering drawing. In this project, the test will determine that the skill and level how to read and interpret the drawing. It is favourable to use the test to know their level and can increase their skill also. Besides that, engineering drawing is the important knowledge in engineering courses. When the test effective for them, many advantages can be derived and it also makes them better.

1.6 Limitation of Study

Reading interpreting engineering drawing is the important subject in engineering world. This test actually wants to measure the novice engineers' ability. Besides that, there are too many fresh graduate engineers who are in Malaysia. They must increase their level and skills to get the job at any company. Nowadays, the company wants the employee to have experience and also must have the skills. The test is the one way to make the fresh graduate to know how to read and interpret the engineering drawing.

CHAPTER 2
LITERATURE REVIEW

This chapter briefly describes about the analysis on how undergraduate engineering students interpret and reading the engineering drawing. Undergraduate engineers are difficult to translate well how to read engineering drawings with good skills. This chapter will show how to study and previous studies made in the analysis of how best to make the engineers can interpret engineering drawings better. There are many ways that have been made during previous studies and surveys such as do, do the exams, questionnaire and others. Other than that, a lot of do's and used to determine the level of an undergraduate engineer manipulate and interpret engineering drawings with good and great is a way to do the test read engineering drawing that takes time to answer it. There, it will be able to assess the level of a person and thus can help undergraduate engineers to hone their skills.

2.1 Introducing Engineering Drawing

A drawing is a graphic representation of an object, or a part of it, and is the result of creative thought by an engineer or technician. When one person sketches a rough map in giving direction to another, this is graphic communication. Graphic communication involves using visual materials to relate ideas. Drawings, photographs, slides, transparencies, and sketches are all forms of graphic communication. Any medium that uses a graphic image to aid in conveying a message, instructions, or an idea is involved in graphic communication (Taffesse, 2005).

Engineering drawing is a basic course for all undergraduate Engineering program.

Though engineering drawing is considered as the language of engineers, most of the universities offer this course as a practical course without any lecture component. This course is aimed at providing basic understanding of the fundamentals of Engineering Drawing; mainly visualization, graphics theory, standards & conventions of drawing, the tools of drawing and the use of Drawings in engineering applications (Taffesse, 2005).

Figure 2.1 is an example engineering drawing in 2D shape. From the 2D drawing it can be 3D drawing or solid model. 2D drawing is the base in engineering drawing. It's very important to design and develop something new.

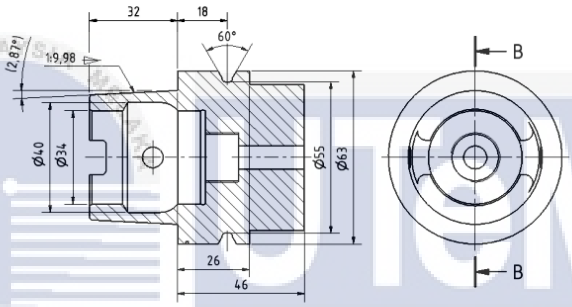

Figure 2.1: Example of 2D drawing (Laikemariam Kassa, 2005)

The technical drawing is the one of engineering drawings. On the other hand, is not subtle, or abstract. It does not require an understanding of its creator only an understanding of technical drawings. A technical drawing is a means of clearly and concisely communicating all of the information necessary to transform an idea or a concept into reality. Therefore, a technical drawing often contains more than just a graphic representation of its subject. It also contains dimensions, notes and specifications (Laikemariam Kassa, 2005).

2.1.1 Types of Technical Drawing

Technical drawings are based on the fundamental principles of projections. A projection is a drawing or representation of an entity on an imaginary plane or

planes. This projection plane serves the same purpose in technical drawing as is served by the movie screen. A projection involves four elements.

1. The actual object that the drawing or projection represents.
2. The eye of the viewer looking at the object.
3. These projectors create an imaginary plane of projection.
4. Imaginary lines of sight called Projectors.

The two broad types of projections, both with several sub classifications, are parallel projection and perspective projection.

2.1.2 Purpose of Technical Drawing

To appreciate the need for technical drawings, one must understand the design process. The design process is an orderly, systematic procedure used in accomplishing a needed design. Any product that is to be manufactured, fabricated, assembled, constructed, built, or subjected to any other types of conversion process must first be designed. For example, a house must be designed before it can be built.

2.1.3 Application of Technical Drawing

Technical drawings are used in many different applications. They are needed at any setting, which involves design, and in any subsequent forms of conversion process. The most common applications of technical drawings can be found in the fields of manufacturing, engineering and construction. For instance, designer engineer, mechanical engineers uses technical drawings to document such works as the layout of a new product, or make the process build the new product must start with a design first.

2.2 How to Read and Interpret Engineering Drawings

Engineering drawings are typically used as visual tools in the creation of machines, parts, and others. While these drawings can be quite straightforward to individuals who are skilled in the field of engineering or architecture, they can be quite difficult to interpret for lay people. Knowing how to read engineering drawings will help provide the person with a better idea of make the machine parts. Undergraduate engineers cannot interpret the engineering drawing with better because not disclosed in detail. Have 5 steps or ways how to interpret and reading engineering drawing which can help the undergraduate to know and learn.

2.2.1 Familiarize With The Scale Of Drawings

Understanding how large or small certain items will be is essential when reading engineering drawings. While most engineering drawings are created in "scale" versions of 1/4-1/8 inches (. 55-. 275 centimetres) per foot, other scales may be used for very large creations. Always determine the scale of the drawing before examining it in detail. If the scale is not obviously evident in the drawing, consult with the engineer who drew it for clarification.

2.2.2 Understand The Basic Symbols

As these drawings are done on such a small scale, the use of symbols is frequently required. While many symbols exist, understanding a few of the basics can be very helpful when reading engineering drawings. Some of the most common symbols used in these drawings include rectangles, circles, and triangles. As with determining the scale, consulting with the engineer who created the drawing can provide great insight as to the symbols used.

2.2.3 Look for Circled Numbers

As discussed previously, engineering drawings are typically done on a scale so small that creating detail is almost impossible. Because of this, engineers often add circled numbers to certain portions of the drawings. These circled numbers indicate that the area identified is shown in greater detail on another page.

2.2.4 Identify Specific Abbreviations

Abbreviations are a useful tool for engineers. Like symbols, they can indicate shapes, processes, and even dimensions through a few letters. Some of the most common abbreviations used in engineering drawings include DP, which stands for depth, and DIA, which stands for diameter.

2.2.5 Work With Colleagues

When all else fails, consult with other professionals to better clarify the drawings. While it may be embarrassing to admit that you are having trouble interpreting the drawing, those who regularly work with and understand the drawings will help you read them. Ask "in the know" individuals on the project to clarify anything you do not understand; better that this happens in the early stages of a project than to encounter a mistake farther into a project because of improperly reading engineering drawings.

2.3 Method Drawing Skills

In read and interpret engineering drawings it something it uses all kinds of ways to translate. There are previous studies that examined the various methods used to read engineering drawings and some tests done to assess and define the level undergraduate engineers to learn and interpret an engineering drawing.